REMARKS

Claims 68-72, 78-79 and 81-89 are pending in the present application. In the Office Action dated March 10, 2003, the Examiner rejected claims 68-71, 78-79, 81-89 under 35 U.S.C. § 103(a) as being unpatentable over either Japanese Patent No. 08-064,561 to Naoki ("Naoki") or U.S. Patent No. 5,439,551 to Meikle *et al.* ("Meikle"). In view of the following amendments and remarks, reconsideration of the present application is respectfully requested.

The disclosed embodiments of the invention will now be discussed in comparison to the prior art. Of course, the discussion of the disclosed embodiments, and the discussion of the differences between the disclosed embodiments and the prior art subject matter, do not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner appreciate important claim distinctions discussed thereafter.

Applicant discloses a microelectronic substrate with implanted materials that allows accurate detection of an endpoint of chemical mechanical planarization of such substrates, particularly those having complex topographies (i.e., as a plurality of recesses and raised surfaces) that must be polished to form a uniform blanket surface. In the disclosed embodiments, a relatively small amount of the endpoint detection material is implanted beneath the surface of the microelectronic substrate at a depth "d" which, when reached by the planarizing process, is indicative of having achieved a blanket surface for the microelectronic substrate. In addition, the endpointing material is implanted in a specified thickness "t" at the selected depth d below the surface of the microelectronic substrate. The implanted substance is implanted at a concentration that does not affect the electrical properties of the microelectronic substrate, for example at about 0.0001% to about 0.1%. Typically, the distance d is about 200 A and the thickness t is about 100 to 500 A, so that the endpointing material is detected across substrates having complex surface topologies. During the planarization of the microelectronic substrate, the materials released into the slurry are monitored by vaporization of a sample of the slurry using mass spectroscopy, emission spectrometry or similar species analyzers. The first detection of the endpointing material at the first depth d indicates that planarization has gone at least to the predetermined depth. The last detection of the endpointing material indicates that planarization has continued at least to a depth equal to the thickness t of the endpointing material beneath the surface, indicating that planarization has formed a blanket surface and is therefore complete.

When the endpointing material is detected by the mass spectrometer, emission spectrometer or similar species analyzers, a control system coupled to the foregoing devices and to the planarization machine receives a control signal from the device, and halts the planarization of the substrate by stopping relative motion between the carrier assembly and the platen. The species analyzer and the control system may be cooperatively configured to stop the planarization process shortly after the detection of the endpointing material. Alternatively, the control system and the species analyzer may be configured to allow planarization to proceed for a predetermined period of time following the detection of the endpointing material.

The Naoki reference discloses a planarization apparatus configured with a mass spectrometer for detecting the endpoint of the planarization process. However, the Naoki reference fails to disclose such an apparatus configured with a control system that may be used to interrupt the planarization process when the endpoint material is detected. Moreover, the Naoki reference fails to disclose or fairly suggest that the control system may be configured to interrupt the planarization process at a predetermined time interval following the exposure of the endpointing material.

The Meikle reference also discloses a planarization process that permits the determination of a polishing endpoint. In particular, Meikle discloses various means for determining the endpoint, including the detection of an audio signal from the substrate, or determining a change in an audio signal as the endpoint is reached. Meikle also discloses chemical and optical methods for determination of the endpoint. In particular, a system for monitoring a pH level in a slurry material is disclosed that monitors the pH of the slurry as the endpointing material is exposed and distributed into the slurry (col. 5, lines 30-40). No control is disclosed that interrupts the operation of the planarization machine upon the determination of a change in the pH concentration of the slurry. Further, Meikle discloses that a mass spectrometer may be used to detect the exposure of an endpoint material in the substrate (col. 6, lines 1-11). Again, Meikle fails to disclose or fairly suggest a control system coupled to the spectrometer and to the planarization apparatus discontinues the planarization process upon the detection of an endpointing layer. If the undersigned has missed a relevant teaching in the foregoing references, the Examiner is respectfully requested to point out where the relevant teachings may be found.

Turning now to the claims, patentably distinct differences between the applied references and the claim language will be pointed out. Claim 68, as amended, recites in pertinent part, "An apparatus for detecting the endpoint of a planarizing process comprising... a

planarizing device having a first portion and a second portion movable relative to the first portion to remove material from the microelectronic substrate positioned therebetween, the material including atoms of the first and second substances...transport means to move the material from the planarizing device...a mass spectrometer coupled to the transport means to receive the material and detect the atomic mass of the second substance...and...*a controller operatively coupled to the planarizing device and the mass spectrometer to control motion of the planarizing device upon receiving a control signal from the mass spectrometer.*" (Emphasis added). The Naoki reference does not disclose or fairly suggest a control system operatively coupled to the planarizing device that controls the motion of the device when a signal is received, as described in greater detail above. The Meikle reference also similarly fails to disclose or fairly suggest a control system configured to control the motion of a planarization device. Accordingly, claim 68 is allowable over the cited references. Claims depending from claim 68 are similarly allowable based upon the allowability of the base claim and further in view of the additional limitations recited in the dependent claims.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

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